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timely preventive measures, the discovery of tubercle bacilli rendered timely therapeutic measures, possible. Besides these, indeed, only Pasteur's inoculations against hydrophobia, anthrax, symptomatic anthrax, and swine erysipelas, remained to be mentioned; and the first of these probably did not belong to bacteriology at all, though they had grown on its soil. "But," concluded Professor Koch, "it will not always remain so. Therapeutics proper will also derive benefit from bacteriology; hardly, indeed, for diseases of rapid course, in which prevention will remain the main thing, but certainly for slow diseases, such as tuberculosis. Others also, like Billroth, maintain this hope; but the mistake has frequently been committed of beginning the experiment on human subjects. I regard this as wrong, and look upon the alleged successes of various remedies, from benzoate of soda to hot air, as illusory. For years past I have been seeking means for the therapeutic treatment of consumption, but I began with the pure cultivation of the bacillus. I found a number of substances,—etheral oils, tar-pigments, mercurial vapor, salts of gold and silver, especially cyanide of gold, for instance,—some of which, like the last, even when very strongly diluted, prevent the growth of the bacillus, which, of course, suffices to bring the disease to a standstill. All these substances, however, have proved ineffectual when used against the bacillus in the bodies of animals. I continued my search, however, and found what I sought. Susceptible as the guinea-pig is to the tubercle bacillus, it proved non-inoculable when treated with the substances in question, and even when its disease was far advanced it could be brought to a standstill by this means. This fact may give occasion to search for similar effective remedies in other infectious diseases also, and here lies the field for an international contest of the highest and noblest kind."

EXCAVATIONS IN JUDÆA.¹

THE traveller from Hebron to Gaza cannot fail to be struck with the sudden contrast presented by the mountainous country that he leaves behind him, and the long stretch of almost level plain into which he descends. After passing Bêt-Jibrîn, in which some scholars would see the sight of the ancient Gath, he has to wend his way through narrow defiles and precipitous limestone crags until he suddenly finds himself in the rich plain which forms the *Negeb*, or district of "southern" Judæa. On the first occasion on which I traversed it, however, it was not the sharp contrast between mountain and plain that first attracted my attention: it was rather the number of *tels*, or artificial mounds, with which the plain is covered. Each *tel* marks the site of an ancient city or village; and no archæologist could help reflecting, as he gazed upon them, what a rich field must here await the future excavator. Among them I noted two or three of remarkable height and size, and longed for an opportunity of discovering the historical secrets that lay hidden within them. It was more especially on a lofty mound, which my dragoman told me was called Tel 'Ajlân, that I cast covetous eyes.

The curiosity which the site of the mound excited has now been partially gratified. After ten years of patient importunity, the Palestine Exploration Fund succeeded last spring in obtaining permission from the Turkish Government to excavate in the south of Palestine; and Mr. Flinders Petrie, the prince of living excavators, placed his services at the disposal of the fund. In spite of obstacles of every nature, presented by the climate, by Turkish officialism, and by the character of the Bedouin inhabitants of the country, his few weeks of work have produced truly marvellous results. We now know something of the art and building of the Israelites in the period of the Kings, and even of that older Amorite population whom the Israelites conquered. It has become possible to speak of Palestinian archæology, and to determine the age of the pottery and hewn stones which are met with in the country. Where all before was chaos, order at last has begun to reign.

The firman granted by the Porte allowed excavations to be conducted over an area of 9½ square kilometres in the neighborhood of Khurbet 'Ajlân, but enjoined that all objects found, including

even duplicates, should be handed over to a Turkish commissioner specially appointed to oversee the work. When, however, Mr. Petrie arrived in Jerusalem at the beginning of March, he found, that, owing to a trifling error of description, the firman was detained in Constantinople; and it did not reach Jerusalem, where Mr. Petrie was awaiting it in the midst of violent storms and penetrating cold, until the very end of the month. At last it came, but, in spite of the courtesy and assistance of the enlightened Pacha of Jerusalem, further delays were interposed by the Turkish commissioner; and it was not until April 14 that work could be commenced, one week only before Ramadan. What Ramadan means is known too well to those who have lived in the Mohammedan East. An unbroken fast throughout the day, followed by feasting at night, renders even the most industrious disinclined for work. And Mr. Petrie had to deal with a population naturally disposed to steal rather than to work, and who had never tried their hands at excavating before. It was no wonder that the excavator from time to time thought regretfully of the industrious and intelligent *fellahin* he had left behind in Egypt, and longed to see the "savages" who now squat on the fertile plain of Judæa swept back into their ancestral desert homes.

Mr. Petrie began with some preparatory digging at a place known to the geographers as Umm el-Laqlâq, which has been supposed to be the site of the once important fortress of Lachish. The first time I visited the spot I was told that the real name of the hill-slope was Umm el-Latîs; and three years ago, when I visited it for a second time, I satisfied myself that it represented nothing more than the site of a village of the Roman age. Mr. Petrie's excavations have abundantly confirmed my conclusion. The site, he found, was covered with only six to eight feet of artificial earth, which was filled with fragments of Roman pottery, and in one place a worn coin of Maximian Hercules was disinterred two feet above the virgin soil. Accordingly, he soon moved with his workmen to the *tel*, which formed the most prominent object in the district where he was permitted to dig.

The *tel* is about six miles from the village of Burêr, and near the site of a Roman hamlet which goes by the name of Khurbet 'Ajlân, or "Ruin of Eglon." It proves not to be called Tel el-'Ajlân, "the mound of the Eglonite," as my dragoman informed me, but Tel el-Hesî, apparently from a spring of water which flows past the eastern face of the mound. The spring is the only source of fresh water that exists for many miles around, and falls into a brackish brook which trickles from the neighboring Tel en-Nejîleh, the united stream being subsequently swallowed up in a stony *wadi* a few hundred yards lower down. Mr. Petrie is doubtless right in thinking that it was to this spring that the city now represented by the Tel el-Hesî owed its importance. The spring would have borne the same relation to the old town that the spring of the Virgin bore, and still bears, to Jerusalem. When swollen by rain, the stream is capable of doing a considerable amount of mischief. It has washed away a large portion of the eastern and south-eastern sides of the mound, thus laying bare a section of the *tel* from its top to the bottom. This has proved, however, of invaluable service to the explorer, as the time at his disposal would never have allowed him to uncover a tenth part of the soil which has been removed by the water. Another season of work would have been needed before the lowest part of the *tel* could have been reached, and the history of the mound revealed, together with that of the pottery which is embedded in it. The kindly assistance of the water was the one piece of good fortune that fell to Mr. Petrie's lot, and he knew how to make the most of it.

On the southern and western sides of the *tel* is an enclosure, about thirty acres square, which is surrounded by a "clay rampart" still seven feet high in certain parts, and in one place by a brick wall. As there is but a slight deposit of earth within the enclosure, while nothing was found in it, Mr. Petrie is doubtless right in holding that it was intended to shelter cattle in case of an invasion. It probably belongs to the later period of the city to which it was attached.

The city is represented by the *tel* or mound. This rises to a height of no less than sixty feet, formed by the accumulated ruins of successive towns, the lowest of which stood on a platform of

¹ Article by A. H. Sayce, in *The Contemporary Review* for September.

natural soil about fifty feet above the stream which runs through the *wadi* below. The mound is about two hundred feet square.

Mr. Petrie's description of it reads like the record of Dr. Schliemann's discoveries at Troy. City has been piled upon city, the latest colonists being Greeks, whose settlement was itself swept away before the age of Alexander the Great. The lowest and earliest city was the most important, if we may judge from the size of the wall with which it was encircled. This was 28 feet 8 inches thick, and was formed, like the walls of an Egyptian city, of clay bricks baked in the sun. It had been twice repaired in the course of its history, and it still stands to a height of twenty-one feet. As thin black Phœnician pottery was found above it, which Egyptian excavation has shown to be not later than about B.C. 1100, we may follow Mr. Petrie in regarding the wall as that of one of those Amorite cities which, as we are told, were "walled up to heaven" (Deut. i. 28). It is the first authentic memorial of the ancient Canaanitish population which has been discovered in Palestine. As large quantities of potsherds have been met with both outside and within it, we now know the precise characteristics of Amorite pottery, and can consequently tell the age of a site on which it occurs.

The city to which the wall belonged was taken and destroyed, and the wall itself was allowed to fall into ruin. Then came a period when the site was occupied by rude herdsmen or squatters, unskilled in the arts either of making bricks or of fortifying towns. Their huts were built of mud and rolled stones from the *wadi* below, and resembled the wretched "shanties" of the half-savage Bedouin, which we may still see on the outskirts of the Holy Land. They must have been inhabited by members of the invading Israelitish tribes who had overthrown the civilization that had long existed in the cities of Canaan, and were still in a condition of nomadic barbarism. We may gather from the Book of Judges that the period was brought to an end by the organizing efforts of Samuel and the defeat of the Philistines by Saul. With the foundation of the Israelitish monarchy came a new epoch of prosperity and culture. Jerusalem and other cities were enlarged and fortified (1 Kings ix. 15-19), and the Chronicler tells us (2 Chron. xi. 5) that after the revolt of the Ten Tribes the chief cities of Judah were further strengthened by Rehoboam. The ruins of Tel el-Hesi furnish numerous evidences of this new epoch of building. First of all, we have a wall of crude brick thirteen feet thick, which is probably identical with a wall traced by Mr. Petrie along the western and northern faces of the *tel*, where it ends in a tower at the north-west corner. However this may be, the section laid bare by the stream on the eastern face of the *tel* shows that the thirteen-foot wall was repaired and rebuilt three or four times over. All these rebuildings must be referred to the age of the Kings, since the only remains of post-exilic times discovered on the mound are those of the Greek settlement of the fifth century B.C.

One of the later rebuildings is illustrated by a massive brick wall twenty-five feet thick, and of considerable height, which Mr. Petrie has discovered on the southern slope of the *tel*, and which he refers to the reign of Manasseh. It has been built above a *glacis* formed of large blocks of stone, the faces of which were covered with plaster. Mr. Petrie has traced the *glacis* to a height of forty feet, and has found that it was approached by a flight of steps, at the foot of which, in the valley, was a fortified building, of which only the gateway now remains. The earth on which the *glacis* rests is piled ten feet deep around a large building eighty-five feet in length, and composed of crude brick walls more than four feet in thickness. Ten feet below the building are the ruins of another large building, which, after having been burned, was rudely put together again out of the old materials. The original edifice was of crude brick, with doorways of "fine white limestone." Several slabs of the latter have been discovered. On three of them is "a curious form of decoration by a shallow pilaster, with very sloping side, resting on a low cushion base, and with a volute at the top." As Mr. Petrie remarks, "we are here face to face at last with work of the earlier Jewish kings, probably executed by the same school of masons who built and adorned the Temple of Solomon." In the volute Mr. Petrie sees a representation of a ram's horn, and calls to mind the biblical expres-

sion, "the horns of the altar." Whether this be so or not the volute is an earlier form of that which characterizes the Ionic capital. On one of the slabs is a *graffito*, which must have been scratched upon the stone by one of the subjects of Solomon or his immediate successors. It represents a lion or dog walking; and, as the slab was built into the reconstructed edifice upside down, the drawing must have been made while the stone still formed part of the original edifice. This can hardly have been erected at a later date than the reign of Rehoboam.

The stones of the *glacis* have led Mr. Petrie to a very important conclusion. They are draughted, the surface of the stone being smoothed away towards the edges so as to leave a rough projection in the middle. But they show no trace of the claw-tool, or comb-pick, as Mr. Petrie prefers to call it. Now, this tool is characteristic of Greek work; and as it was used in Greece in the pre-Persian era, while it was introduced into Egypt only after the contact of Egypt with Greece, we may infer that it was of Greek invention. Its employment in Palestine, therefore, would imply that any building in which it was used belonged to the Greek age, Mr. Petrie's excavations at Tel el-Hesi having shown that older Jewish work exhibits no traces of it: consequently the dispute as to the age of the Harâm wall at Jerusalem is at last settled. Here the stones have been dressed with a claw-tool from the foundation upwards, and it becomes clear, accordingly, that they must all be referred to an Herodian date. I have always felt doubtful about the antiquity commonly ascribed to them on the strength of certain masons' marks pronounced by Mr. Deutsch to be early Phœnician characters. But it is questionable whether they are characters at all: at any rate, they do not belong to an early form of the Phœnician alphabet, and no argument can be drawn from them as to the pre-exilic origin of the monument on which they occur.

But while the date of the great wall which surrounds the Mosque of Omar at Jerusalem is thus brought down to the classical period, the very fact which has reduced its claims to antiquity has served to establish the pre-exilic character of another monument near Hebron. This is the Râmet-el-Khalîl, or "Shrine of Abraham," about three miles to the north of Hebron. The huge blocks of stone of which this building was composed have never been touched by the claw-tool, and we may therefore see in them the relics of a temple the foundation of which must be older than the exile. Can it represent the site of Kirjath-sepher, the Canaanite "city of books"?

In Tel el-Hesi Mr. Petrie sees the ruins of Lachish.¹ The spring which flowed beneath its walls is, as has been said, the only fountain of fresh water which gushes from the soil for many miles around; and the spot would naturally, therefore, have been selected as the site of an important fortress. How precious such a supply of water would be may be judged from the fact that the brackish stream which flows from the smaller and more insignificant Tel en-Nejîleh was in ancient times confined there by a massive dam. We know that Lachish was one of the chief fortresses of Judæa, and its capture by Sennacherib was considered sufficiently memorable to be depicted in a bas-relief on the walls of that monarch's palace; we know also that it stood somewhere in the neighborhood of the present Tel el-Hesi. On the other hand, the name of Khurbet 'Ajlân, given to an adjoining site, might incline us to believe that the *tel* represents Eglon rather than Lachish. Eglon and Lachish, however, were close to one another, and, considering that Lachish was the larger and more important town of the two, Mr. Petrie is probably right in locating it at Tel el-Hesi. In that case Tel en-Nejîleh will be Eglon.

If Tel el-Hesi is Lachish, the monuments of sculpture and inscription overthrown there by Sennacherib must still be lying within its ruins. Indeed, even more precious relics of the past may await the explorer of the old Amorite city. Among the tablets discovered at Tel el-Amarna are despatches to the Egyptian king from Zimridi and Yabniel, the governors of Lachish, which prove that the art of writing the Babylonian language in cuneiform characters upon clay was known and practised there. The city was the seat of a governor, and it is reasonable to suppose

¹ Major Conder had already suggested the same identification (Memoirs of the Survey of Western Palestine, iii. p. 261).

that the governor's palace contained an archive chamber. For aught we know, the clay tablets with which the archive chamber was once stored may still lie buried under the *débris* which has concealed the ruins of the Amorite city for so many generations from the eyes and ravages of man.

However this may be, Mr. Petrie's excavations, brief and imperfect as they have necessarily been, have taught us two important facts. The first of these facts is the mutability of local nomenclature in the East. The recurrence of an ancient name in the mouths of the modern inhabitants of Palestine by no means implies that the place to which it is given is the representative of an ancient locality of the same name. The utmost it can prove is that the ancient site is probably to be sought in the near neighborhood of the spot to which the name is now applied. The existence of a name like Khurbet 'Ajlân, given though it may be to a comparatively recent site, may yet show that the Eglon of the past once stood somewhere in its vicinity. But it can do no more. The tides of war which have swept from time to time over the civilized East have displaced the older population, have reduced the earlier cities of the land to "ruinous heaps," and have transferred their inhabitants to other places. When the Jews returned from the Babylonian exile, they were in most cases likely to settle in the open country, at a distance from the barren mounds which were all that remained of the older cities. The new Eglon would arise, not on the site of the more ancient one, but where the settlers would be surrounded by green pastures or cultivated fields. The fact is a warning to those who would place the ancient Megiddo at Mujedda on the evidence only of a similarity of name, or who would transform the "Stone" of Zohemoth into the Cliff of Zehwele, in defiance of philology and geography.

The second fact brought to light by Mr. Petrie is, that, if we are ever to learn any thing about pre-exilic Israel on the soil of Palestine itself, it must be by the help of the spade. His excavations have shown that up to now we have known nothing, or next to nothing, of the archæology of the Holy Land before the classical age. They have further shown what a rich harvest, on the other hand, awaits the excavator. Already the basis has been laid for a scientific study of Palestinian antiquities; the sites that cover the ground can now be assigned to their respective ages by means of the pottery they contain; and we can tell from a simple inspection of the stones of a building whether or not it belongs to the pre-exilic epoch. The future excavator will no longer set to work in the dark, trusting for success to chance and luck: he will know beforehand where and how to dig, and with what rewards he is likely to meet. The explorer who will devote himself to the labor, as Sir A. H. Layard devoted himself to Nineveh and Dr. Schliemann to Troy, will obtain results as marvellous and far-reaching as those obtained by Layard and Schliemann. The former story of Palestine has not been obliterated from its soil, as has often been imagined: on the contrary, it is indelibly impressed on the stone and clay which that soil still holds in its bosom. We have dug up Homer and Herodotus: we shall yet dig up the Bible.

Mr. Petrie's excavations could not be continued long enough to allow him to penetrate to that central core of the *tel* where alone he could expect to meet with inscribed stones. Apart from stonemasons' marks, in the shape of early forms of Phœnician letters, the only inscription he has disinterred is scratched on the fragment of a terra cotta vase. The inscription he assigns to the age of Hezekiah. One of the letters composing it, however, has a very archaic form, and it may therefore belong to an earlier period. But, like the famous Siloam inscription, it indicates in a curious way what was the ordinary writing-material employed by the Jews. The "tails" of certain letters are curved, the curve being represented on the refractory terra cotta by two scratches, which together form an angle. It is clear from this that the Hebrews must have ordinarily written on papyrus or parchment, where the longer lines of the characters would naturally run into curves, and not, like the Moabites, for instance, on clay, stone, or metal. They were a literary rather than a monumental people.

A seal found in Jerusalem, and belonging to Mr. Clark, has at last given us a clew to the relative age of the few Jewish inscriptions of the pre exilic period which are at present known to us.

The inscription upon it states that it was the property of "Elishama", the son of the King." Now, we hear about this Elishama' from the prophet Jeremiah (xli. 1), who tells us that he was of "the seed royal," and the grandfather of Ishmael, the contemporary of Zedekiah. Elishama', accordingly, will have flourished about B.C. 650, and we can therefore now determine what were the forms taken by the letters of the Jewish alphabet at that particular time. Comparing them with the forms of the letters in the Siloam inscription, we find that the latter must be somewhat, though not greatly, older, and that consequently the general opinion is justified which considers that the construction of the tunnel commemorated by the inscription was a work of Ahaz or Hezekiah. A fixed point of departure has thus been obtained in Hebrew epigraphy.

The excavator, then, who continues Mr. Petrie's work next season will be equipped with knowledge and resources which, only six months ago, were not even dreamed of. Discoveries of the highest interest await him,—monuments of David and Solomon and their successors; it may be even the clay records of the Amorite priests and chieftains whom the children of Israel dispossessed. The bearing such discoveries may have upon the interpretation and criticism of the Old Testament Scriptures, the light they may throw upon the conquest of Canaan or the establishment of the Davidic monarchy, cannot even be conceived; but we may feel sure that such discoveries will be achieved, if only the means of achieving them are provided: and provided we cannot doubt they will be, as soon as the results of Mr. Petrie's preliminary campaign are made known to scholars and lovers of the Bible. In wealthy England the Palestine Exploration Fund cannot fail to find that money for the work will flow to it in abundance.

SUGAR AND THE SUGAR-CANE IN CUBA.

M. TRUY, French consul at Santiago de Cuba, says, according to the *Journal of the Society of Arts*, London, that the cultivation of the sugar-cane in the eastern portion of the Island of Cuba is almost entirely confined to the districts of Santiago, Guantanamo, and Manzanillo. This cultivation, although it has experienced some extension of late years, is not in the flourishing condition it was twenty years ago. This falling-off is due to the civil war, which ruined many planters and discouraged others. The profits, however, realized for some time past by those planters who had sufficient credit, or confidence in the future, to continue to engage in this industry, have given a stimulus to the cultivation of the cane. Sugar-factories have been established in many parts, particularly in the district of Guantanamo and Manzanillo; old sugar-factories have been supplied with fresh plant; and many planters, encouraged by the high prices recently realized, have hastened to get their ground ready for cultivation. Part of the products of the province of Santiago is shipped to Spain, and some small quantity is consigned each year to Canada; but the United States absorbs almost the whole of the yield of the island. The Cuba market was some years ago controlled by French merchants, who owned the greater part of the sugar-factories of the province; but since the civil war many planters sold their estates, and retired to France. A few estates, however, are still owned by Frenchmen, at Guantanamo especially. Those known as Sainte Marie, Sainte Cecile, and San Antonio are directed or owned by Frenchmen. All the land in the island is, in general, fit for the cultivation of the cane, an even surface being generally chosen with a view to facilitate the working and the harvesting. The ground should also be as near the sea as possible, so as to avoid the cost of carriage and transport, which is particularly high in that part of the island, where it may be said there is an absence of railroads, and the carriage roads are in a deplorable condition. If the ground chosen is one that has hitherto been uncultivated, the planter, first of all, clears it in cutting down the branches of the trees and small shrubs with the *machete*, and burning the larger trees. The expenses of these preliminary operations may be estimated at from four hundred to five hundred dollars per plantation of thirteen hectares (the hectare is equivalent to 2.47 acres). Holes are then dug at intervals of from three to four feet, and in them are placed hori-